FACTORS INFLUENCING CERVICAL PROPRIOCEPTION IN INDIVIDUALS WITH NECK PAIN

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ABSTRACT

BACKGROUND: Neck pain is a common problem among the general population, and impaired proprioception is an important problem that subsequently leads to cervical sensorimotorcontroldisturbancesifleftuntreated.Thereisconflictingevidenceregardingthe association of neck disorder type, range deficit, deep neck flexor strength, endurance of neck flexors, and extensor strength with cervical proprioceptive impairment.

AIM: To identify the factors that could influence cervical joint proprioception error (CJPE) in individuals with neck pain.

METHODS: A total of 186 subjects who fulfilled the inclusion criteria were included after obtaining informed consent to participate. Upon enrollment, demographic and other basic clinical data were obtained. Then subjects underwent evaluation of pain intensity using the Numeric Pain Rating Scale (NPRS), cervical range using a bubble inclinometer, deep flexor andextensorendurancetesting,deepflexorstrengthusingCraniocervicalflexiontest(CCFT), regionalfunctionusingtheNeckDisabilityIndex(NDI),andcervicalproprioceptionusingthe Cervico-Cephalic Relocation Test (JPE). Pearson correlation was used to examine the correlation, and the significantly correlating variables were entered into a multiple regression with backward elimination analysis to know their influence on CJPE.

RESULTS: Co-relationalanalysisofthepresumedfactors revealedasignificant andpositive association ($p<0.001$) between all except for gender for error in CJPE extension and right rotationdirection,neckrotationrangeoflimitationtotherightside(forerrorinalldirections), forwardheadposturefor errorinCPJEleftrotationdirection,anddisabilityscore(forerrorin all directions).

Age, pain intensity, pain duration, limited neck right lateral flexion, deep neck flexors, and endurance of cervical flexors and extensors significantly influence CJPE in all directions.

CONCLUSION: Subjects with neck pain showed significantly greater cervical joint proprioception errors. Advancing age, high pain intensity, longer pain duration, weak deep neck flexors, decreased endurance of cervical flexors and extensors, and neck lateral flexion deficitssignificantlyinfluencecervicalproprioception.Considerationoftheaboveinformation in the evaluation and management of neck pain could lead to better proprioception and functional ability in this population.

KEY WORDS: Neck pain, proprioception, cervical joint position error, cervico-cephalic relocation test

INTRODUCTION

Neck pain is a common problem among general population, leads to significant functional limitation and ranks fourth worldwide as a causative factor for related disability. The mean estimates are 7.6%-point prevalence (range, 5.9–38.7%), 37% annual prevalence (range,16.7–75%),and48.5%lifetimeprevalence(range,14.2–71%)(1).Theadultpopulation (15–74yrs) shows a point prevalence ranging from 5.9% to 38.7%, prevalence of the elderly population ranges between 8.8% and 11.6%. However, neck pain is found more frequent in females than males (2).

Neck pain usually presents with the symptoms of unilateral or central pain, with or without radiation, limited cervical range of motion, reduced strength of global and deep muscles, cervical head ache and all these symptoms appear with great degree of variability. Neck pain is often persistent or recurrent in nature with high chance to go in for chronicity, therefore the underlying causative mechanisms need to be managed to prevent such impact. Along with other symptoms and the current claim for chronicity includes proprioceptive impairment of cervical region (3).

Proprioception involves sensations which are generated within the body; that contributes to the awareness of relative orientation of body parts, both at static and dynamic position. This proprioceptive system depends upon simultaneous activity of different types of mechanoreceptor and afferent neurons. They provide information for reflex regulation of muscletone,awarenessofpositionsenseandmovementsense,andhavebeenisolatedinmost spinal tissues (4).

Impairmentofcervicalproprioceptionasstatedabovewasanimportantprobleminthe neck pain group which occurs through a variety of mechanisms that subsequently lead to

cervicalsensorimotorcontroldisturbancesifleftuntreated(3).Thesedisturbanceswhich occurssecondarytoneckpainistheresultofaprotectiveresponsetopacifythepainfultissue.
Long-term sustenance of movement control problem could lead to further tissue damage, increase pain through peripheral and central nervous system sensitization, and leads to movement dysfunctions (5). Restoration of healthy neuromuscular movement patterns and increasedsensoryinputthroughproprioceptiontrainingisthoughttoreducemechanicalstress through improved muscular co-ordination and may prevent recurrence and chronicity of neck pain (6).

The cervical muscles are rich in proprioceptors, because of this they were able to contributeforsensorimotorfunctionandhelpinthemaintenanceofstaticanddynamicpostures oftheregion.Eitherweaknessorenduranceproblemsinvolvingcervicalmusclesfoundtoalter neck proprioception which eventually affects cervical joint position sense, head and eye movement controlandpostural stability. Exercisestargetingdifferent aspects ofsensorimotor function, in particular, retraining aimed at improving cervical proprioception and muscle coordination are currently recommended in the management of neck pain (7).

Individuals with increased intensity and duration of neck pain found to have greater joint position error and the possible cause for this change is the production of abnormal pain afferents due to altered free nerve ending discharges. This could lead to impaired kinesthetic inputofthecervicalregioninapainfulstate(8).Elderlypersonswerefoundtohavehighjoint position error than young individuals, as age advances the resulting physiological changes, diminishedmemoryaswellascognitiveormotorabilitiespredisposesthemvulnerabletosuch errors and the same could be considered as a valid source for frequent fall and fear (9).

Forward head posture was a common presentation in subjects with neck pain and it places excessive stress to both contractile and non-contractile structures around neck thereby predispose to pain (10). This position takes the neck soft tissues to an altered length tension relationshipincreasingtheflexionmomenttherebyplacingthesemusclesatadisadvantageous statetowardsmovementcontrol.DuetothisalteredmuscleperformanceindividualswithFHP findsdifficulttorelocatetheheadtothetargetheadpositionduringproprioceptiveevaluation resulting in higher joint position error when compared to normal subjects (11).

Theneckflexorandextensorendurancewerenotcorrelatedwiththejointpositionerror when tested for joint repositioning accuracy in flexion and extension direction (12,13). Deep neck flexor endurance and muscle size correlated well with neck pain and not with cervical joint position error (14). Several studies have established that cervical proprioception is impaired in individuals with chronic neck pain and whiplash injury, but still there is no information available regarding proprioceptive impairment among the acute neck pain population.

Asstatedabovethereisconflictingevidenceregardingtheassociationofneckdisorder type, range deficit, deep neck flexor strength, endurance of neck flexors, and extensor with cervical proprioceptive impairment. The available evidence, recommends that patients with neck pain should be assessed and managed for cervical proprioceptive impairment and sensorimotor control disturbances. Thus, the study was aimed at analyzing the factors influencing the cervical Proprioception in individuals with neck pain.

NEEDFOR THE STUDY

Proprioceptionandbalanceimpairmentswerepresentinneckpainandhealthypopulation. Conflicting evidence and association found between neck muscle endurance, pain intensity, and disorder type and duration with joint position error. Limited information is available regarding proprioceptive impairment among the acute neck pain population.

Nopreviousstudiesdoneanalyzingthefactorsthatcouldinfluencecervicalproprioception, if known could add more insight towards the time, population, exercise selection, and management. So, the purpose of the study is to identify and analyze the factors that influence cervical proprioception in subjects with neck pain.

REVIEWOFLITERATURE

Theliteraturereview wasbasedonthefollowinginclusioncriteria:

1. ImpairedProprioceptioninneckpain
2. Cervico-CephalicRelocationTestin assessingJointPositionError(JPE).
3. PressurebiofeedbackinassessingDeepCervicalFlexors(DCF)endurance.
4. Neck FlexorEnduranceTest(NFET)
5. NeckDisability Index (NDI)inmeasuringdisability 6.Influence of age on cervical proprioception
7. Influenceofpainintensityoncervicalproprioception
8. Influenceofforwardheadpostureon CJPE

Searchmethodforidentifyingthepublishedrelevantstudiesusedelectronicdatabasesranging from year 2012 to 2022 Published articles in English were used for the review process. Electronic databases such as, PubMed, Cochrane database for systemic reviews, PEDro and Google scholars were used. Search items used were, impaired proprioception in neck pain, Cervico Cephalic Relocation test in assessing JPE, Pressure biofeedback in assessing DCF endurance, Neck Flexor Endurance Test, Neck Extensor Endurance Test, Neck Disability. Boolean search “and”, “or” between key words was used.

Neckpainformsamajorpublichealthissuebothintermsofpersonalhealthandoverall, well-being, with a prevalence rate of 30-50%of adults among general population. Approximately,50-85%ofindividualswithneckpaindon'texperiencecompleteresolutionof symptoms and may go on to chronic, disabling pain.

Mechanical neck pain is the general term that refers to any type of pain caused by placingabnormalstressandstrainonmusclesofneck.Typically,mechanicalneckpainresults from poor postural habits therefore it accounts about 22 to 70% of the general population and more prevalent in middle age group.There are numerous structures presented in the cervical regionthatcanbesourcesofnociception,includingzygapophysealjoints,vertebralendplates, muscles, ligaments, neural structures and the intervertebral disc. However, there is lacking in evidencetosupportthehypothesisthatthesepathoanatomicalfeaturesaretheprimarysource of mechanical neck pain across the age spectrum in the majority of the population. Subjects with neck pain are presented with the symptoms of reduced active cervical range of motion, reduced cervical and scapulothoracic muscle strength, myotome weakness.

ImpairedProprioceptioninneckpain

Neck pain is a common musculoskeletal disorder and acostly publichealth issue. The pain is often persistent or recurrent in nature. The underlying mechanisms for recurrence or persistent remain unclear but could be associated with altered Proprioception from the neck muscles, which have a vital role in providing input for cervical joint position sense.

A study was done to find the association of age on cervical joint position sense (JPE) whichquantitativelyassessedtheassociationbetweenageandcervicalJPEandcomparedJPE between young and older asymptomatic subjects. Concluded that proprioception errors were greater in older age group.

Cervical JPE was measured for all the subjects with the active movements angle reproduction test in degrees using a digital inclinometer, testing was done in all Cervical movement'sdirections(flexion,extension,sidebendingrightandleft,Rotationrightandleft). Subjects were divided into two groups: young and older and JPE was compared.JPE was significantly larger (for all movement direction) in the older subjects group. Advancing age was significantly associated with the increasing cervical JPE and the older subjects showed greater error when compared to younger subjects (15).

A study to find out the effect of dorsal neck muscle fatigue on Cervico-cephalic kinaesthetic sensibility, involved twenty-five asymptomatic young adults who underwent measurement of dorsal neck muscle strength with a digital dynamometer. The repositioning errors were measured using head to neutral repositioning test and head to target repositioning test. The subjects were then exposed to dorsal neck muscle fatigue exercise protocol and the outcomemeasureswereevaluated.Dorsalneckmusclestrengthwassignificantlyreducedand repositioning errors in sagittal plane were significantly increased after the fatiguing protocol. No difference in repositioning errors was found following the fatiguing protocol frontal and transverse plane movements. It was concluded that dorsal neck muscle fatigue alters cervical position sense in sagittal plane movements (16).

A past study on sensory motor function and dizziness in neck pain: Implications for assessmentandmanagement,depictedthesensorimotordeficitsfrom alteredcervical afferent input especially in upper cervical spine. According to this study, clinical experience and research indicates that significant sensorimotorcervical Proprioception disturbances might be animportantfactorinthemaintenance,recurrenceorprogressionofvarioussymptomsinsome patients with neck pain (17).

Cervico-CephalicRelocationtestinassessingJointPosition Error (JPE)

The cervical joint position error tests one's ability to relocate the head back to center aftertheneckmovementsintransverseorsagittalplanes.Thedistancebetweenthetargetpoint and the relocated point is the global Cervico-cephalic relocation error.

According to a study on effect of neck torsion on joint position error in subjects with chronic neck pain, twenty-five volunteers with chronic neck pain and twenty-six healthy controls were assessed on three tests of JPE- conventional JPE, JPE neck torsion and Enbloc using Fastrak and LASER apparatus. The study concludes that, LASER method when compared to Fastrak may be useful as a clinical measure of repositioning errors for both conventional and torsional tests (18). A systematic review states that the Joint Position Sense Error (JPSE) in patients with neck pain concluded that 'number of repetitions' is a major element in correctly performing the JPSE test (19) .

PressurebiofeedbackinassessingDeepCervicalFlexors(DCF)endurance

Pressure biofeedback assesses the ability of utilizing the deep flexors (rectus capitis anterior, rectus capitis lateralis, longus colli and longus capitis).In case of chronic neck pain patientshavebeenfound tohavedecreasedactivationandenduranceofdeep cervicalflexors.

A study was conducted to determine the reliability of Cranio Cervical Flexion Test (CCFT)with60asymptomaticindividuals.TheCCFTwasmeasuredoneachsubjectbytwo testersforinter-raterreliabilityandbyoneofthetestersafteragapofsevendaysfortheintra-rater reliability. The inter- and intrarater reliability was found to be high (intra-class coefficient = 0.90, standard error of mean = 0.73 and intra-class coefficient = 0.98, standard error of mean = 0.29 respectively) confirmed by a Bland and Altman limits of agreement analysis (20).

The efficacy of endurance training on DCF muscles using pressure biofeedback was done in a study with 60 mechanical neck pain subjects. The author has concluded that, DCF training with visual biofeedback training showed statistically and clinically significant improvement in pain, neck mobility, DCF endurance and Neck Disability Index (NDI) when comparedtoDCFtrainingwithoutvisualbiofeedbacktrainingandDCFtrainingwithpressure biofeedback without visual input (21). This study has reported the Minimal Clinically Important Difference (MCID) of DCF endurance to be 2.00 mm Hg (22).

A past study on efficacy of pressure biofeedback guided deep cervical flexor training on neck pain and muscle performance in visual display terminal operators wherein, a total of fifty patients with neck pain participate in the study and were randomly divided into pressure biofeedback group and control group undergoing exercise program. The study concluded that theadditionofpressurebiofeedbackalongwithconventionalexerciseprogramforaperiodof six weeks lead to increased DCF muscle performance compared to conventional exercises alone (23).

NeckExtensorEnduranceTest (NEET)

The inter-rater reliability of NEET to distinguish the weakness of both superficial and deepneckextensorswasconductedwith30participants.Individualsdiagnosedwithneckpain were randomly included and examined by two proficient Musculo-skeletal physiotherapists. The ability to hold on to the chin tuck position for 20seconds with patient in prone, head and neckoutofthetable and cervicothoracicjunction stabilizedwasassessed. Inabilitytorestrain chin tuck thereby performing neck extension and flexion indicates the weakness of deep neck extensors and global neck extensors respectively. The study concluded that the inter-rater reliabilityforNEETwasverygood.ItisreportedthatMinimalDetectableChange(MDC)and StandardErrorofMeasurement(SEM)wasfoundtobe2.34minand0.84minrespectively (24).TheMinimalClinicalImportantDifference(MCID)is73seconds.(23)

NeckDisabilityIndex(NDI)

The neck disability index was developed in the late 1980s and published in 1991 to measureself-ratedpainanddisabilityinpatientswithneckpain.Itcomprisestensections,each with a score up to 5, for a total of 50.

The Neck Disability Index is destined to measure neck-specific disability. The questionnaire has 10 items concerning pain and activities of daily living including personal care, lifting, reading, headaches, concentration, work status, driving, sleeping and recreation. NDIhasthemostsufficientsupportandusefulnesstoretainitscurrentstatusasthemostused self-report measure of neck pain (25).

Accordingtoasystematicreview,Measurementpropertiesoftheneckdisabilityindex, using a standard search strategy (1966 to September 2008) and four databases (Medline, CINAHL, Embase, and psych info), a structured search was conducted and supplemented by web and hand searching. In total, thirty-seven published primary studies, three reviews, and oneinpresspaperwereanalyzed.ThestudyconcludedthattheNDIhassufficientsupportand usefulness to retain its current status as the most commonly used self- reported measures for neckpain.Morestudiesofclinicallyimportantdifferenceindifferentclinicalpopulationsand the relationship to subjective/work/function categories are required. (26).

INFLUENCE OFAGEONCPJE

Previousstudiesfoundthatneckpainisalsocausedbythechangesintheneckmuscle co-ordination which in turn reduces the muscles activation. Therefore, the structural and functional changes in the musclespindle affect the afferent input which leads to alterations in cervical Proprioception. This impairments could lead to decreased physical performance and increased concerns about falling, particularly in an elderly population (15).

Inastudytodeterminetheassociationofageoncervicaljointpositionerror,Atotalof 230 subjects were enrolled, into two groups young (n=169) and older (n=61) and JPE was compared.JPEwassignificantlylarger(forallmovementdirections)intheoldersubjectgroup (P<0.001). Advancing age was significantly associated with the increasing cervical JPE and older subjects showed greater errors when compared to younger subjects.

INFLUENCE OF PAIN INTENSITY ON CJPE

Subjectswithneckpainhasapositiveinfluencebetweenpainandproprioceptionwhich has a greater impact on chemically mediated substances during the pain response, thereby it may alter free nerve ending discharges due to sensitization and produces an abnormal pain afferent(gamma-motorneuronandmusclespindle).Thiscouldbeleadtoimpairedkinesthetics input in an individual (8).

In a Cross-sectional study, it has two groups CS(n=132) and healthy age matched control(n=132)wereevaluatedforcervicalJPE.CSsubjectsshowedstatisticallysignificantly larger JPEs compared to healthy control subjects in all the directions tested. The mean JPE errors in the CS group ranges from 6.27°to 8.28° and in the control, groupranges from 2.36° to 4.48°. Therefor the study found that there is a significant and positive relationship between neck pain intensity and cervical proprioception ($p \leq 0.001$).

INFLUENCEOFFORWARD HEADPOSTUREON CPJE

Cervicalproprioceptionhasagreaterinfluenceonposturalcontrol,gaitcontrolaswell as body balance. In forward head

posture,there will be a altered muscle length which could leadstoreducesthegenerationofmuscletensioncapacity.FHP-occursmainlydueto
prolongedstaticposturewhichresultinexcessivestresstobothcontractileandnon-contractile structures , thereby it predispose to neck pain (27).

In the study, 84 dentists were divided into two groups based on their craniovertebral (CV) angle FHP group (44 subjects with mean age 34.95 ± 6.68 years and CV angle 49□ or less)andahealthygroup(40subjectswithmeanage29.80±6.46years,CVangle□49□).FHP group showed a significant difference ($p \leq 0.001$) in cervical JPE measurements in all directions tested compared to healthy subjects. Therefore, this study established that subjects with FHP demonstrate significant impairment in cervical proprioception.

SUMMARY

Thereviewofliteratureforthepresentstudyupholdstheneedofproprioceptivedeficitsinan individual with neck pain with the content addressing the factors which is influencing a Cervical Proprioception. Most of the studies states that Age is one of the factors which significantlyassociatedwithalteredcervicalJPE.Hencesupportstheconceptofanalyzingthe factors which is going to influencethe cervical JPEin an individual with neck pain. Thus, the literature paves the way for incorporating the various factors which is highly influencing Cervical JPE in an individual with neck pain, Therefore the available evidence, recommends that patients with neck pain should be assessed and managed for cervical proprioceptive impairment and sensorimotor control disturbance.

AIMSANDOBJECTIVES

AIM:

Theaimofthestudyistoidentifythefactorsthatcouldinfluencecervical
proprioceptioninindividualswithneckpain.

OBJECTIVE:

Toidentifytheeffect of age, disordertype,pain duration, pain intensity, forwardhead posture, range deficit, the endurance of flexor and extensor, and disability on cervical proprioception.

METHODOLOGY

This observational study was conducted in Rehabilitation Center, Physiotherapy Outpatient Department, Faculty of Physiotherapy, SRIHER. Ethical approval was obtained from the Institutional Ethical Committee and registered with Clinical Trial Registry of India. (**IEC NO: CSP/22/MAY/110/328**)

Atotalof186individualswhobelongtotheagegroupof20-60yrs,withthehistoryof neck pain, with or without radiation into dorsal or upper limb, able to understand the purpose of study (English or Tamil) as explained by investigator and willing to participate were considered for inclusion. Subjects with previous history of surgery in cervical spine, inflammatorydisease,vertebro-basilararteryinsufficiency, malignancy, neurologicaldisease, whiplash injury, cervical myelopathy were excluded.

TheSubjectswhomettheinclusioncriteriawererecruitedforthestudy,afterobtaining written consent to participate and all underwent a standardized musculoskeletal assessment, comprising the evaluation of pain, cervical range of motion, deep cervical muscle strength & endurance, regional function and cervico-cephalic proprioception. Using patient self-reported numeric pain rating scale (NPRS), single bubble inclinometer, cranio cervical flexion test (using Chattanooga's pressure biofeedback), neck flexor endurance test, neck extensor endurance test , Neck Disability Index (NDI) and cervico-cephalic relocation test (CCRT) respectively.

NPRSisawidelyusedscaleforassessinglevelofpainintensity.Ithashighreliability
&validityforassessingthelevelsofpainintensitywherethesubjectsareaskedtoindicatethe
intensityofcurrentpainstateoverthepast24hoursusingan11-pointscale.NPRSrangesfrom 0 to 10 where zero represents 'no pain ' and ten represents 'worse pain'.

Bubble Inclinometer is a more reliable instrument for measuring cervical range of motion. The subjects are asked to sit up straight on a chair with his/her back well supported, arms by the side and both feet placed flat on the floor. With the above-mentioned position maintained the inclinometer was placed on top of the vertex along the sagittal plane for flexion/extension,coronalplaneforlateralflexion,insupinelyingwiththeheadstraightfacing
upwardsandtheinclinometerwasplacedontheforeheadjustabovetheeyebrows forcervical rotation. After ensuring the reading on the device is at 0°, subjects were asked to perform desiredmotionwithfullpossibleeffortandthereadingontheinclinometeratextremesofeach motion was recorded and documented as the range of motion extend for each direction.

Cranio cervical flexion test (CCFT) was performed with the patient in supine crook lyingwiththeneckinaneutralposition(nopillow),theun-inflatedpressuresensorwasplaced
behindthenecksothatittouchestheoccipitandtheninflatedtoabaselinepressureof20mm
Hgtofillthespace.Thecraniocervicalflexiontestsdeterminestheactivationofdeepcervical flexors, where the subjects were instructed to perform the head nodding action gently and slowlytakingcareofnottoextend.Sequentiallyincreasepressurefromthebaselineof20mm Hg to a maximum of 30 mm Hg in five target position maintaining each for 2 seconds.

The endurance of cervical flexor muscle was assessed with the subject in hook-lying position, chin in maximal retraction and instructed to lift the head approximately 2.5 cm (1 inch) above the plinth while maintaining chin retraction. The evaluator places one hand just below the occiput to ensure the maintenance of retraction and the test was continued

till the subject losses chin tuck or head touching evaluator hand.

Theenduranceofcervicalextensormusclewasassessedinpronelyingwithheadover theedgeofthebed andthesubjectswereasked todoachintuck(cranio-cervicalflexion)and hold the head steady in this position with chin tuck till the possible extend. The duration of hold in both instances was recorded in second(s) and documented as cervical flexor and extensor muscle endurance capacity.

VARIABLES	MEAN (S.D)
AGE	38.3(11.5)
GENDER(N)	Male–105 Female–81
PAININTENSITY	6.29(1.49)
PAINDURATION	5.35(1.45)
CROMFLEXION(Degree)	47.75(7.63)
CROMEXTENSION(Degree)	44.59(9.83)
CROMRT LATERALFLEXION(Degree)	43.49(5.60)
CROMLTLATERAL FLEXION(Degree)	54.31(13.32)
CROMRTROTATION(Degree)	54.31(13.32)
CROMLT ROTATION(Degree)	66.49(11.46)
FLEXOR ENDURANCE	17.26(4.94)
EXTENSOR ENDURANCE	14.60(5.32)
DEEPFLEXORSTRENGTH (mmHg)	22.81(2.04)
FORWARDHEADPOSTURE	0.64(0.47)
NECK DISABILITY INDEX	24.17(9.42)
CJPE FOR FLEXION (Degree)	5.62(0.87)
CJPEFOREXTENSION(Degree)	5.82(0.81)

CJPEFORRTROTATION(Degree)	6.24(0.91)
CJPEFORLT ROTATION(Degree)	7.30(1.75)

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tion test was performed in sitting position, approximately 90 cms from in front a target maze in blindfolded state with a laser pointer attached on the head. In this position the subjects were instructed to memorize the neutral head position with reference to the maze in order to duplicate it after relocation. Once the reference point was achieved,thesubjectconcentratesonthispositionforacoupleofsecondsandthenperformsa maximal flexion/ extension and rotation (left and right) for approximately two seconds, then triestofindtheinitialreferencepointwithamaximumofprecisionwithoutspeedinstruction. When subject reaches the reference point, he should again concentrate on the reference point for several seconds. 8-10 trials were performed with eyes opened before the actual performance.Theactualperformanceisdonewitheyesclosedandwithoutanyfeedback.The distancebetweenthetargetpointandtherelocatedpointwastakenasglobalcervico-cephalic relocation error. The most significant/greatest change in relocation was documented as reposition error and considered for further analysis.

Neckdisabilityindex(NDI)isthemostwidelyusedinstrumentforassessingself-rated disability in patients with neck pain. It is a self -rated, condition-specific functional status questionnaire with 10 items including pain intensity, personal care, lifting, work, headaches, concentration, sleeping, driving, reading, and recreation.

The response to each item is rated on a 6-point scale from 0 (no disability) to 5 (completedisability).Thenumericresponsesforeachitemaresummedforatotalscoreranging between0and5,butevaluatorshavechosentomultiplytherawscoreby2andthenreportthe NDI on a 0–100% scale. NDI scores vary from 0 to 50, where 0 is considered “no activity limitation” and 50 is considered “complete disability". The NDI has sufficient support and usefulness to retain its status as the most commonly used self-report measure for neck pain.

TICALANALYSISThe statistical analysis was erformed using statistical package SPSS Software. Statistical significance was

set at P < 0.05. Pearson correlation was used to examine the correlation between age, gender,disordertype, pain intensity, pain duration, cervical rangeof motion,cervicalflexorandextensorendurance,forwardheadpostureanddisabilityoncervical Proprioception.Thesignificantlycorrelatingvariablesasindependentvariableandthe JPEas dependent variable (all direction) was entered into a multiple regression with backward elimination analysis to know the significant influence.

TABLE:1DEMOGRAPHIC &BASELINE DATA

TABLE2:CORRELATIONANALYSISBETWEENCERVICALJOINTPOSITION ERROR AND INDEPENDENT VARIABLES

VARIABLES	CJPE FLEXION		CJPE EXTENSION		CJPE ROTATION RT		CJPE ROTATION LT	
	r	p	r	p	R	p	r	p
AGE	-0.23	0.00*	0.19	0.00*	0.21	0.00*	0.73	0.04*
GENDER	0.13	0.06	0.16	0.02*	0.13	0.05*	0.84	0.78
PAININTENSITY	0.83	0.00*	0.76	0.00*	0.76	0.00*	0.79	0.00*
PAINDURATION	-0.12	0.03*	-0.17	0.01*	-1.41	0.02*	-0.12	0.00*
CROMFLEXION	-0.81	0.00*	-0.79	0.00*	-0.80	0.00*	0.80	0.00*
CROMEXTENSION	-0.59	0.00*	-0.47	0.00*	-0.48	0.00*	0.56	0.00*
CROMRTLATERALFLEXION	-0.38	0.00*	-0.25	0.00*	-0.20	0.00*	0.26	0.00*
CROMLTLATERAL FLEXION	-0.17	0.01*	-0.22	0.03*	-0.23	0.00*	0.20	0.00*
CROMRTROTATION	0.05	0.50	0.04	0.34	0.04	0.56	0.07	0.06
CROMLT ROTATION	-0.37	0.00*	-0.32	0.00*	-0.30	0.00*	0.32	0.00*
FLEXOR ENDURANCE	-0.41	0.00*	-0.45	0.00*	-0.37	0.00*	0.35	0.00*
EXTENSOR ENDURANCE	-0.37	0.00*	-0.33	0.00*	-0.29	0.00*	0.29	0.00*
DEEP FLEXOR STRENGTH	-0.39	0.00*	-0.38	0.00*	-0.42	0.00*	0.43	0.00*
FORWARDHEADPOSTURE	-0.19	0.00*	-0.14	0.02*	-0.06	0.03*	0.12	0.08
NECK DISABILITY INDEX	0.04	0.56	-0.14	0.35	0.03	0.68	0.12	0.08

CJPE=Cervical joint positionerror

**.Correlation issignificant atthe 0.01level (2-tailed).

*.Correlationis significantatthe 0.05level (2-tailed).

TABLE3: REGRESSIONANALYSISBETTWEENCERVICAL JOINT POSITION ERROR FOR FLEXION AND INDEPENDENT VARIABLES

VARIABLES	β	R2 value	Std error	Beta	t	Sig	95.0% Confidence Interval	
							Lower Boun d	Upper Boun d
AGE	-.050	0.81	.027	-.343	-1.841	0.03*	-.104	.004
PAININTENSITY	.139	0.77	.153	.127	.913	0.03*	-.162	.441
PAINDURATION	.025	0.71	.029	.070	.887	0.04*	-.031	.082
CROMFLEXION	-.033	0.71	.030	-.174	-1.10	0.51	-.093	.026
CROMEXTENSION	.023	0.61	.033	.102	.689	0.46	-.042	.087
CROMRT FLEXION	-.004	0.72	.024	-.021	-.180	0.03*	-.052	.043
CROMLTFLEXION	-.026	0.71	.030	-.070	-.850	0.08	-.086	.034
CROMLTROTATION	-.001	0.80	.014	-.006	-.070	0.79	-.029	.027
FLEXOR ENDURANCE	.065	0.80	.050	.185	1.284	0.01*	-.035	.164
EXTENSOR ENDURANCE	-.046	0.81	.052	-.115	-.867	0.02*	-.149	.058
DEEPFLEXORSTRENGTH	-.070	0.84	.078	-.081	-.904	0.00*	-.223	.083
FORWARDHEADPOSTURE	-.038	0.71	.313	-.010	-.121	0.94	-.655	.579

CJPE=Cervicaljoint positionerror

**.Correlation issignificant atthe 0.01level (2-tailed).
*.Correlationissignificant atthe0.05 level (2-tailed).

TABLE:4REGRESSIONANALYSISBETWEENCERVICALJOINTPOSITION ERROR FOR EXTENSION AND INDEPENDENT VARIABLES

VARIABLES	B	R2 value	Std error	Beta	t	Sig	95.0% Confidence Interval	
							Lower Bound	Upper Bound
AGE	.008	0.82	.016	.086	.521	0.01*	-.023	.039
GENDER	-.268	0.70	.167	-.127	-1.61	0.90	-.597	.061
PAININTENSITY	.060	0.69	.086	.082	.695	0.03*	-.110	.229
PAINDURATION	-.044	0.47	.022	-.152	-1.96	0.03*	-.088	.000
CROMFLEXION	-.014	0.67	.018	-.112	-.799	0.17	-.050	.021
CROMEXTENSION	.025	0.70	.019	.17	1.30	0.49	-.013	.064
CROMRT FLEXION	-.015	0.82	.014	-.12	-1.06	0.02*	-.043	.013
CROMLTFLEXION	.015	0.34	.020	.062	.756	0.24	-.024	.055
CROMLTROTATION	-.001	0.66	.008	-.005	-.061	0.97	-.017	.016
FLEXOR ENDURANCE	-.038	0.77	.028	-.161	-1.37	0.02*	-.093	.017
EXTENSOR ENDURANCE	.016	0.73	.024	.073	.690	0.02*	-.030	.063
DEEPFLEXORSTRENGTH	.001	0.61	.046	.001	.013	0.01*	-.089	.091
FORWARDHEADPOSTURE	-.016	0.01	.178	-.007	-.089	0.08	-.368	.336

CJPE=Cervical joint positionerror
**.Correlationis significantatthe 0.01level (2-tailed).
*.Correlationis significantatthe 0.05level (2-tailed).

TABLE:5REGRESSIONANALYSISBETWEENCERVICALJOINTPOSITION ERROR FOR RT ROTATION AND INDEPENDENT VARIABLES

VARIABLES	B	R2 value	Std error	Beta	t	Sig	95.0% Confidence Interval	
							Lower Bound	Upper Boun d
AGE	.020	0.72	.015	.199	1.27	0.04*	-.011	.050
GENDER	-.041	0.43	.169	-.018	-.244	0.90	-.374	.292
PAININTENSITY	.050	0.66	.087	.065	.575	0.02*	-.121	.221
PAINDURATION	-.032	0.51	.020	-.117	-1.60	0.04*	-.071	.007
CROMFLEXION	-.033	0.70	.018	-.243	-1.77	0.51	-.069	.004
CROMEXTENSION	.030	0.68	.019	.200	1.62	0.48	-.007	.067
CROMRT FLEXION	-.004	0.41	.012	-.029	-.299	0.02*	-.028	.020
CROMLTFLEXION	.012	0.40	.020	.045	.584	0.66	-.028	.052
CROMLTROTATION	.003	0.83	.009	.024	.310	0.73	-.015	.020
FLEXOR ENDURANCE	-.003	0.57	.025	-.013	-.125	0.02*	-.053	.047
EXTENSOR ENDURANCE	-.011	0.75	.023	-.047	-.471	0.02*	-.056	.034
DEEPFLEXORSTRENGTH	-.012	0.70	.047	-.021	-.256	0.00*	-.105	.081
FORWARDHEADPOSTURE	.007	0.60	.165	.003	.040	0.99	-.320	.333

CJPE=Cervicaljoint positionerror
**.Correlation issignificant atthe 0.01level (2-tailed).
*.Correlationis significantatthe 0.05level (2-tailed).

TABLE6:REGRESSIONANALYSISBETWEENCERVICALJOINTPOSITION ERROR FOR LT ROTATION AND INDEPENDENT VARIABLES

VARIABLES	β value	R2 value	Std error	Beta	t	Sig	95.0% Confidence Interval	
							Lower Bound	Upper Bound
AGE	.001	.716	.025	.010	.059	0.04*	-.048	.051
PAININTENSITY	.026	.648	.144	.023	.178	0.00*	-.259	.310
PAINDURATION	.005	.690	.030	.014	.177	0.00*	-.053	.064
CROMFLEXION	-.019	.747	.029	-.098	-.650	0.51	-.076	.038
CROMEXTENSION	.020	.738	.029	.093	.699	0.48	-.037	.078
CROMRT FLEXION	.000	.714	.019	.001	.008	0.04*	-.037	.037
CROMLTFLEXION	-.012	.801	.029	-.033	-.403	0.68	-.069	.046
CROMLTROTATION	-.004	.703	.014	-.022	-.263	0.79	-.030	.023
FLEXOR ENDURANCE	.043	.709	.038	.123	1.133	0.00*	-.032	.118
EXTENSOR ENDURANCE	.001	.636	.033	.004	.036	0.03*	-.064	.066
DEEP FLEXOR STRENGTH	-.056	.621	.075	-.069	-.750	0.00*	-.204	.091

CJPE=Cervical jointpositionerror

**.Correlation issignificant atthe 0.01level (2-tailed).

*.Correlationis significantatthe 0.05level (2-tailed).

RESULTS

The demographic and other clinical data of the enrolled individuals are presented in table1.Correlationanalysisofthepresumedfactorsasindependentvariableswiththecervical joint position error in flexion, extension, rotation right and left as dependent variable reveals that gender for error in CPJE Extension & RT Rotation direction, neck rotation range of limitation to the right side (for error in all direction), forward head posture for error in CPJE LT Rotation direction and disability score (for error in all direction) did not correlate significantly (Table 2). Other factors correlated significantly with the concerned error in specificdirection,thesignificantlycorelatedfactorsarefurtherenteredintoregressionanalysis to know its influence on the specific CJP error.

Regressionanalysisconductedwithcervicaljointpositionerrorforflexiondirectionas dependent variable and other significantly correlated factors as independent reveals that deep neckflexorstrength($p<0.00$)withhighsignificanceandage($p<0.03$),painintensity($p<0.03$), pain duration($p<0.04$), cervical right lateral flexion range of motion limitation ($p<0.03$), cervical flexor endurance ($p<0.01$) and cervical extensor endurance ($p<0.02$) significantly influences cervical joint position error in flexion direction (Table – 3).

Regressionanalysisconductedwithcervicaljointpositionerrorforextensiondirection as dependent variable and other significantly correlated factors as independent reveals that Variables age ($p<0.01$), pain intensity ($p<0.03$), pain duration($p<0.03$), cervical right lateral flexion range of motion limitation ($p<0.02$), cervical flexor endurance ($p<0.02$) and cervical extensor endurance ($p<0.02$), deep flexor strength ($p<0.01$) significantly influences cervical joint position error (Table – 4).

Regression analysis conducted with cervical joint position error for right rotation directionasdependentvariableandothersignificantlycorrelatedfactorsasindependentreveals that Deep flexor strength ($p<0.00$) with high significance influences cervical joint position error. Variable Age ($p<0.04$), pain intensity ($p<0.02$), pain duration ($p<0.04$), cervical right lateral flexion range of motion limitation ($p<0.02$), cervical flexor endurance ($p<0.02$) and cervical extensor endurance ($p<0.02$) significantly influences cervical joint position error (Table – 5).

Regression analysis conducted with cervical joint position error for left rotation as dependent variable and other significantly correlated factors as independent reveals that pain intensity ($p<0.003$), duration ($p<0.004$), deep neck flexor strength($p<0.001$) and endurance($p<0.002$) with high significance influences cervical joint position error. Variables age ($p<0.044$), cervical right lateral flexion range of motion limitation ($p<0.042$) and cervical extensorendurance($p<0.032$)significantlyinfluencescervicaljointpositionerror(Table–6).

DISCUSSION

This study reveals that cervical proprioceptive errors (JPEs) were significantly larger in neck pain population which indicates that cervical proprioception is impaired in subjects with neck pain. Age, pain intensity, pain duration, neck flexion range of motion limitation, deep neck flexorstrength, and flexorand extensor endurancesignificantly influences cervical joint position error in all direction in this research, which signifies the consideration of these factors in the evaluation and management of neck pain.

Age related changes like reduced number and function of muscle spindle, joint and cutaneous receptors are likely to increase cervical JPE in elderly population (28). the reason forthismultidirectionalerror cannotbeattributed onlytodecreasedsensoryfunctionofneck muscles; degenerative changes, poor fitness, sedentary lifestyle, decreased memory attention andcognitivefunctioncouldalsoleadtolargecervicalJPE(29)(30).Inaccordancetotheabove findingsadvancingageinthecurrentstudyhasstrongcorrelationwithcervicalJPEerrorinall direction ($p<0.00$) and significantly influences error in flexion ($p<0.03$), extension ($p<0.01$), right and left rotation ($p<0.04$) of neck.

ThetemporalfeaturesofneckpaindidnotcorrelateconsistentlywithcervicalJPE(31) but in the current study the pain intensity positively and duration negatively correlated significantly with JPE error (Table 2) in all direction. The neck pain intensity and duration significantlyinfluencedcervicalproprioceptionasobservedinastudybyRaviShankarReddy etal(32).Herethesubjectswerenotsubgroupedasacute,sub-acuteandchroniccategory,as a result, current research cannot determine whether pain duration influences JPE differently. Further research can subgroup patients and address this information. Pain intensity was measured subjectively, and this could alter its influence on proprioception.

The same could be the reason for observed variation in many studies. Generally, a positive influence was observed between pain and proprioception (33) such that in a painful state, the free nerve ending discharges are altered and the abnormal afferents alter that kinesthetic input (34) as evident in the current study. Thedecreaseincervicalmusclestrengthwasveryevidentinneckpainpopulation(35-

-37) and these individuals show greater fatigue and weakness in deep flexors and dorsal extensormuscles(38).Theabovechangescanalterthefiringofsensoryreceptorsandthereby influence afferent inputs resulting in altered proprioception (39, 40). Similar to the above finding, here the deep flexor strength correlated negatively with flexion, extension, and right rotation direction and positively with left rotation. Cumulatively deep neck flexor strength significantlyinfluencedcervicalJPEinalldirection.Thedeepflexorendurancewasevaluated withclinicalflexorendurancetestasstatedinvariousresearchesitcannotclearlydifferentiate deepandsuperficialmusclecontributionanddidnotcorrelatesignificantlywithproprioception in individuals with and without neck pain. In the current research the deep neck flexor endurance correlated negatively in flexion, extension, and right rotation direction and positivelywithleftrotationerrors.NeckflexorendurancesignificantlyinfluencedcervicalJPE in all direction.

Thedeepneck extensors contributetothemaintenanceofcervicallordosis workingin concurrencewithdeepflexorsandcreditedasintersegmentalstabilizersofcervicalregion.(41) Decreased neck extensor

endurance and related fatigue found to alter neck proprioception as cervicalmusclesingeneralfoundtohaverichandincreaseddensityofmusclespindles.(42)In the current studydeep neck extensorstrength correlated negatively in flexion, extension, and right rotation direction and positively with left rotation errors.

Neck extensor endurance significantly influenced cervical JPE in all direction. This supportstheclaimthatdorsalneckmusclesareimportantforstabilityandmaintainingneutral neck position during daily activities. (43)

The above finding related to neck muscle strength and endurance signifies that the force-generatingcapabilitiesofthecervicalmusclessignificantlyinfluencetheproprioceptive sensibility and reduction in their performance or disturbances between the local and deep musclesmightleadtoimbalancesoroverloadingofcervicaltissues(44)(45)andthenecessity to consider them in the treatment.

Except cervical right rotation range deficit, restriction of range of motion in other directionscorrelatednegativelyinflexion,extension,andrightrotationdirectionandpositively with left rotation error. But limited neck right lateral flexion alone significantly influenced cervicalJPEinalldirection.Inthecurrentstudygreaterrepositioningerrorwasfoundwithleft neck rotation direction, as stated above limited right lateral flexion influenced error in all directiontheexactmechanismforthiscouldnotbedeterminedwiththecurrentfindingsfuture study can address this association.

Lelila et al found that neck disability score was negative correlated with CJPE in left rotationcomponentamongchronicneckpainandasymptomaticindividuals (46).Inourstudy forward head posture and neck disability scores did not correlate significantly with cervical JPE. Sub grouping individual based on the presence or absence of postural alteration and severity of disability and if analysed could yield better information.

LIMITATION

Thestudylimitationincludes;individualswerenotcategorizedbasedonagerangeand duration as acute, sub-acute and chronic if done could add more information. Pain intensity was quantified subjectively and objective evaluation may favor the identification of cutoff point and reveal its association with proprioception better. The included independent variable list is not conclusive, there was high chance variable of interest could be missed and addition ofthat would alterinfluencestatus. More Malesubjects wererecruited than female that could have influenced the results; future studies can enroll equal proportion to study the influence.

CONCLUSION

Subjects with neck pain showed significantly greater cervical joint proprioception errors. Advancing age, high pain intensity, longer pain duration, weak deep neck flexors, decreased endurance of cervical flexors and extensors, and neck lateral flexion deficits significantly influence cervical proprioception. Consideration of the above information in the evaluation and management of neck pain could lead to better proprioception and functional ability in this population.

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Thank youforsubmittingtheclarifications.TheInstitutionalEthicsCommittee(forUG&Non-Med.PG Students),SRIHER (DU)approvesthe project.

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FACTORSINFLUENCINGCERVICALPROPRIOCEPTION IN INDIVIDUALS WITH NECK PAIN

PROFORMA

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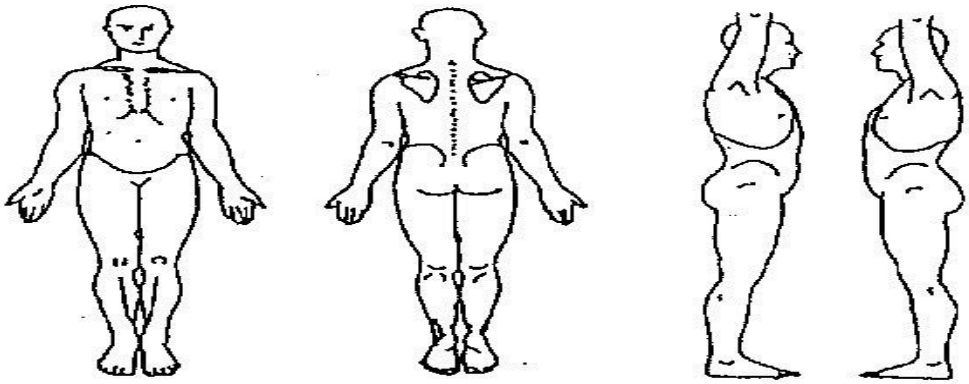
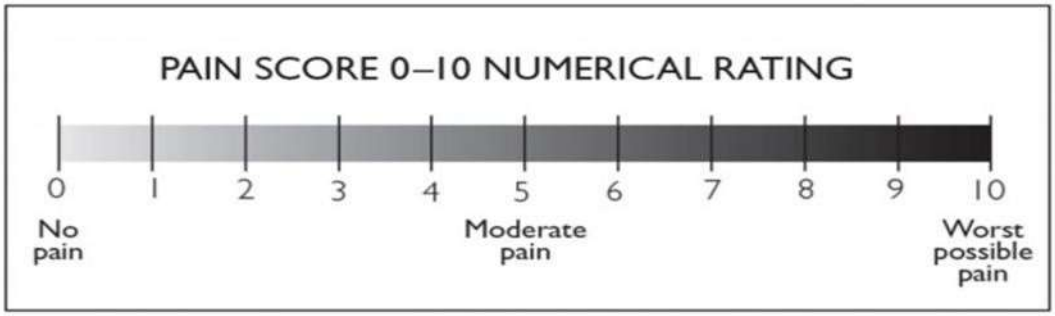
CONTACTNO:
CHIEF COMPLAINTS: PASTMEDICALHISTORY:



PainRatingScale:(pleaserateyourpain)



Pain Assessment:

Onset:

Side:

Site: Duration: Type:
AggravatingFactor: Reliving Factor: Character: Behavior:
Nature: Severity: Irritability:
OBJECTIVEEXAMINATION:

ON OBSERVATION:

Build-

CLEPOWER

Posture–

ON EXAMINATION:

RANGEOF MOTION:

Cervical flexion	
Cervical extension	
Cervical lateral flexion	
Cervical rotation	

MUS

Cervical flexor endurance	
Cervical extensor endurance	
Deep cervical flexor strength	

FUNCTIONAL PERFORMANCE:

Self-reportingmeasuresforneckpain-NeckDisabilityindexscale(NDI)

PROPRIOCEPTIVEEVALUATION:

Cervicaljointpositionerrortest

1. Flexion-
2. Extension-
3. Lateralflexion-
4. Rotation-

SRIRAMACHANDRA MEDICALCENTREANDHOSPITAL
SRIRAMACHANDRAINSTITUTEOFHIGHEREDUCATIONANDRESEARCH (DEEMED TO BE UNIVERSITY)
INFORMED CONSENT

NFLUENCINGCERVICALPROPRIOCEPTIONIN INDIVIDUALS WITH NECK PAIN

NameofthePrincipalInvestigator: MS.VISALI.C.E.J
Descriptionofthe Study:
Natureandpurposeofstudystatingitasresearch

Neck pain is a common condition and one of the leading causes of disability worldwide, with mean estimates of 7.6%-point prevalence (range, 5.9–38.7%), 37% annual prevalence(range,16.7–75%),and48.5%lifetimeprevalence(range,14.2–71%).Proprioception or balance impairments were present in neck pain and healthy population. Conflicting evidence/association found between neck muscle endurance, pain intensity, and disorder typeand duration with joint position error. Limited information is available regarding proprioceptive impairment among the acute neck pain population.

No previous studies done analyzing the factors that could influence cervical proprioception, if knowncouldaddmoreinsighttowardsthetime,population,exerciseselection,andmanagement. So, the purpose of the study is to identify and analyze the factors that influence cervical proprioception in subjects with neck pain.

Voluntaryparticipation: Participation in this study is entirely voluntary and your consent is required before you canparticipate in the study.

Duration of participation with number of participants: 186 subjects will be allocated and the subjects will be assessed for the baseline values for about 45 minutes and the collected data will be subjected to analysis.

Procedures tobe followed: TheSubjects whohavemet theinclusion criteriawould berecruited for the study, after obtaining written consent and the subjects will be undergoing a standardized musculoskeletal assessment. Evaluation of pain, cervical range of motion, cervical muscle endurance, regional function and cervicocephalic proprioception will be obtained from all enrolled subjects. Pain intensity will be measured using patient self-reported numeric pain rating scale, cervical range of motion will be measured using single bubble inclinometer, cervical muscle endurance evaluated by - cranio cervical flexion test (using Chattanooga's pressure biofeedback), neck flexor endurance test, neck extensor endurance test and regional function using Neck Disability Index (NDI) and cervicocephalic proprioception will be assessed using cervical joint position error test (CJPET).

Investigations,ifany,tobeperformed -Nil
Any alternative procedures or courses of treatment that might be as advantageous tothe participant as the procedure or treatment to which s/he is being subjected - Nil
Storage period of biological sample and related data with choice offered to participant regarding future use of sample, refusal for storage, and receipt of itsresults - Nil
PossibleRiskstotheparticipant: Nil
Possible Benefits to the participant: The participants will benefit from more specific exercises to improve sensorimotor disturbances along with neck pain management. This could lead to better clinical outcome and functional ability.
CostandPaymentstotheparticipant: Thereisnocostforparticipationinthisstudy. Participation is completely voluntary and no payment will be provided.
Confidentiality: Information obtained in this study is strictly confidential. Yourname will not be used in reporting information in publications or conference presentations.
Participants' right to withdraw from the study: You have the right to refuse to participate in this study, the right to withdraw from the study, and the right to have your data destroyed at any point during or after the study, without penalty.
VOLUNTARYCONSENTBYTHE PARTICIPANT
Participation in this study is completely voluntary, and your consent is required before you can participate in thisstudy. Ihave read this consent form (or it has been read to me) and I fully understand the contents of this document and voluntarily consent to participate in the study. All of my questions concerning this study have been answered.If I have any questions in the future about this study that will be answered by the investigators listed below. I understand that this consent ends at the conclusion of this study.

ContactAddress withphonenumber:

PI–fromSRMC	Collaborator(ifany)outsideSRMC

Ms.Visali.C.E.J Reg.No:T0220010 MPTOrthopedics&Traumatology No:8939694107 Srmc, Porur.	

A copy of the participant/patient information sheet should be given to the participant for her/ his record.
[In case of illiterate participant, the information is explained and thumb impression is obtained, in the presence of an unrelated witness. Left-hand thumb impression for maleand right hand thumb impression offemale]
By signing this form, I agree to participate in this study. A copy of this form has beengiven to me.

Date: Name:
Participant'sThumbsignature:

Witness name: Witnesssignature:
CERTIFICATIONOFINFORMEDCONSENT

I certify that I have explained the nature and purpose of this study to the above-namedindividual, and I have discussed the potential benefits of this study participation. The questions the individual had about this study have been answered, and we will always be available to address future questions.

Date:

Signatureofpersonobtainingconsent Name:

Signatureof PI:

ஶ்ரீ ராமச்சந்திரா மருத்துவ மமயம் மற்றும் மருத்துவமமைஶ்ரீ ராமச்சந்திர உயர்கல்வி மற்றும் ஆராய்ச்சி நிறுவைம் (பல்கமலக்கழகமாகக்கருதப்படுகிறது)
தகவலறிந்தஒப்புதல்படிவம்

ஆராய்ச்சியிைன்தமலப்பு:
கழுத்து வலி உள்ள நபர்களில் கழுத்து அசைவு மற்றும் நிலை தன்சம உணர்வுகசள பாதிக்கும் காரணிகசள அறிய நடத்தப்படும் ஆய்வு.

முதன்மமபுலைாய்வாளரிைன்பபயர்:விைனாலி.சைா.ஏ.ஜீ

ஆய்விைன் விளக்கம்:
ஆய்விைன் இயல்பு மற்றும் நநாக்கம்: கழுத்து வலி சபாதுவாக அசனவரிடமும் காணப்படுகிறது, மமலும் இவ்வலியினால் அன்றாட சையல்பாடுகள் பாதிக்கப்படுகின்றன .கழுத்து வலி உள்ளவர்கள் மற்றும் சாதாரண நபர்கள் இருவருக்கும் கழுத்து அசைவு மற்றும் நிலை தன்சம குசறபாடுகள் இருந்தன. இவ்வாறான பாதிப்புகளுக்கு கழுத்து வலி ஒரு முக்கிய காரணியாகும்.. நாட்பட்ட கழுத்து வலி உள்ள மக்களிசடமய கழுத்து அசைவு மற்றும் நிலை தன்சம உணர்ைன்சிக்குசறபாடு குறித்து வசரயறுக்கப்பட்ட தகவல்கள் உள்ளன.கழுத்து அசைவு மற்றும் நிலை தன்சமகசளபாதிக்கக்கூடியகாரணிகள்பற்றிய தகவல்கள் முந்சதய ஆய்வுகளிைன் எதுவும் சைால்லப்படவில்சல. அவ்வாறு சதரிந்தால் அவற்றின்கால அளவு ,பாதிப்புக்கு உள்ளான மக்கள், பயிற்சிகள் மற்றும் சிகிைன்சை ஆகியவற்சறப் பற்றிய கூடுதல் தகவல்கசளமைர்க்கமுடியும்.எனமவஆய்வின்மநாக்கம்கழுத்துவலி உள்ள நபர்களில் கழுத்து அசைவு மற்றும் நிலை தன்சம உணர்வுகசள பாதிக்கும்காரணிகசளஅறியபகுப்பாய்வுசைய்வதாகும்.
தன்ைார்வ பங்நகற்பு: இந்த ஆய்வில் பங்கேற்பது முற்றிலும் தன்னார்வமானது, கமலும் நீங்ேள் இந்த ஆய்வில் பங்கேற்கும் முன் உங்ேள்ஒப்புதல்கதவவ.

பங்நகற்பாளர்களிைன் எண்ணிக்மகயும் பங்நகற்பு காலம்: 186 பங்கேற்பாளர்ேள் அய்வுக்கு ஒதுக்ேப்படுவார்ேள் மற்றும்சுமார் 45 நிமிடங்ேளுக்கு மதிப்பீடு செய்யப்படுவார்ேள் பின்னர்

அடிப்பவட அளவீடுேளின்மதிப்புேள்குறிப்பிடப்படும்அய்வுக்குஉட்படுத்தப்படுவர்.

பிைப்பற்ற நவண்டிய நமைமுமறகள்: இந்த ஆய்வு சைன்சன ஸ்ரீ ராமைந்திராமருத்துவமசனயில்உள்ளஜிசதாகுதி*(G–Block)*பிசிமயாசதரபி சவளிமநாயாளர் பிரிவில் நடத்த திட்டமிடப்பட்டது. ஆய்வுக்கு ஒதுக்கப்பட்டநபரிகளிடம்முதலிைஒப்புதைப்படிவம்சபறப்படும்,பின்னர் நநாயாளிகள்முதலிை அடிப்பசட மதிப்பீடு சையப்படுவார்கள், இதில் கழுத்து வலியின் தீவிரத்தின் அளவு,கழுத்து தசை வலிசமகள், கழுத்தின் அசைவுகள், மமலும்தனிமனிதனின் கழுத்து அலசவு மற்றும் நிலை தன்சம உணர்ைசிகள் ஆகியவற்சறஅளவிடப்படும்.

விசாரமணகள்,ஏநதனும்இருந்தால்,பசய்யப்பைநவண்டும்:இல்சல

எந்தபவாருமாற்றுநமைமுமறகள்அல்லதுசிகிச்மசயிைபடிப்புகள் பங்நகற்பாளருக்கு ந்மம பயக்கும் அவர்/அவர் ஐப்படுத்தப்படும் பசயல்முமற அல்லது சிகிச்மசமயப் நபாலநவ சாதகமாக இருக்கலாம்:இல்சல
உயிரியல் மாதிரியிைஃ நசமிப்புக் காலம் மற்றும் மாதிரியிைஃ எதிர்காலம் பயன்பாடு, நசமிப்மப மறுப்பது மற்றும் அதத் முடிவுகமளப் பபறுதல் ஆகியவற்றில் பங்நகற்பாளருக்கு வழங்கப்படும் விருப்பத்துைைஃ பதாைர்பமைய தரவு: இல்சல

பங்நகற்பாளருக்குசாத்தியமாைஅபாயங்கள்:இல்சல

பங்நகற்பாளருக்கு சாத்தியமாை ந்மமகள்: கழுத்து வலிஉள்ள நபர்களின்கழுத்து அசைவு மற்றும் நிலை தன்சம உணர்வுகசள பாதிக்கும்காரணிகசள நமம்படுத்துவதற்கு குறிப்பிட்ட பயிற்சிகள் வழங்கப்படும். இந்தபயிற்சிகசள சையவதன் மூலம் அவர்களின் அன்றாட சையல்பாடுகளும் மமம்படுகிறது.

பங்நகற்பாளருக்காை கட்டணம்: இந்த ஆய்வில் பங்மகற்பதற்கு எந்தவிதகட்டணமகிலடயாது.பங்மகற்பது முற்றிலும்தன்னார்வமானது. மமலும்எவ்விதமானைன்மானம்வழங்கப்படாது.

இரகசியத்தத்மம: இந்த ஆய்வில் சபறப்பட்ட தகவல்கள் கண்டிப்பாக ரகசியமானது.உங்களதுசபயர்கள்மற்றும்எந்தஒருதகவலும்பிறருக்கு சவளியிடப்படாது.

பங்நகற்பாளர்கள்"ஆய்விைஃஇருந்துவிலகுவதற்காைஉரிமமகள்": இந்த ஆய்வில் பங்மகற்க மறுப்பதற்கான உரிசமகள், ஆய்வில் இருந்து விலகுவதற்கான உரிசம மற்றும் ஆய்வின் மபாது அல்லது அதற்குப் பிறகு எந்த மநரத்திலும் அபராதம் இல்லாமல் உங்கள் தரசவ அழிக்கும் உரிசம உங்களுக்குஉள்ளது.
பங்நகற்பாளரிைஃத்தை்ைார்வஒப்புதல்
இந்த ஆய்வில் பங்மகற்பது முற்றிலும் தன்னார்வமானது.மமலும் நீங்கள் இந்த ஆய்வில் பங்மகற்கும் முன் உங்கள் ஒப்புதல் மதசவ. நான் இந்த ஒப்புதல் படிவத்சத படித்திருக்கிமறன்.(அல்லது அது எனக்குப் படிக்கப்பட்டது) மமலும் இந்த ஆவணத்தின் உள்ளடக்கங்கசள நான் முழுசமயாகப் புரிந்து சகாண்டு, ஆய்வில் பங்மகற்க தானாக முன்வந்து ஒப்புக்சகாள்கிமறன்.இந்த ஆய்வு சதாடர்பான எனது அசனத்து மகள்விகளுக்கும்பதில்கிசடத்துள்ளது. இந்த ஆய்சவப்பற்றி எதிர்காலத்தில் எனக்கு ஏமதனும் மகள்விகள் இருந்தால், கீமழ பட்டியலிடப்பட்டுள்ள ஆய்வாளர்களால் பதிலளிக்கப்படும்.இந்த ஆய்வின் முடிவில் இந்த ஒப்புதல் முடிவசடகிறது என்பசத நான் புரிந்துசகாள்கிமறன்.

சதாசலமபசிஎண்ணுடன்சதாடர்புமுகவரி:

SRMC யிலிருந்து முதன்சம ஆய்வாளர்	SRMCக்கு சவளிமய கூட்டுப் பணியாளர் (ஏமதனும் இருப்தால்

சைல்வி.விைாலி.சைா.ஏ.ஜீ இறுதி ஆண்டு, இயன்முசற மருந்துவதுசறஜீ இராமைந்திரா பல்கசலகழகம், மபாரூர்,சைன்சன–600116.	இல்சல

ங்மகற்பாளர்/மநாயாளியின் தகவல் தாளின் நகசல பங்மகற்பாளருக்கு அவரது பதிவுக்காக வழங்கப்பட மவண்டும்.
(படிப்பறிவில்லாதபங்மகற்பாளராகஇருந்தால்,சதாடர்பில்லாத
ைாட்சியின் முன்னிசலயில், தகவல் விளக்கப்பட்டு கட்சடவிரல் பதிவு சபறப்படும்.ஆணுக்கு இடது சக கட்சடவிரல் பதிவும், சபண்ணுக்கு வலது சக கட்சடவிரல் பதிவு சபறப்படும்).
இந்தப் படிவத்தில் சகசயழுத்திடுவதன் மூலம் இந்த ஆய்வில் பங்மகற்க ஒப்புக்சகாள்கிமறன். இந்த படிவத்தின் நகல் என்னிடம் சகாடுக்கப்பட்டுள்ளது.

மததி: சபயர்:

பங்மகற்பாளரின் சகசயாப்பம்: கட்சடவிரல் பதிவு:
ைாட்சிசபயர்:

ைாட்சிசகசயழுத்து:

தகவலறிந்தஒப்புதல்சாைற்றிதழ்

மமற்கூறிய நபருக்கு இந்த ஆய்வின் தன்சம மற்றும் மநாக்கத்சத விளக்கியுள்மளன் என்று ைான்றளிக்கிமறன். மமலும் இந்த ஆய்வில் பங்கமகற்பதன் ைாத்தியமான பலன்கசளப்பற்றி விவாதித்மதன்.இந்த ஆய்சவப் பற்றி தனிநபரின் மகள்விகளுக்கு பதிலளிக்கப்பட்டுள்ளது. மமலும் எதிர்கால மகள்விகளுக்கு பதிலளிக்க நாங்கள் எப்மபாதும் தயாராக இருப்மபாம்.

ஒப்புதல் சபறும் நபரின் சபயர்:

முதன்சமஆய்வாளரின்சகசயாப்பம்:

NeckDisabilityIndex

LASTUPDATEDSEPTEMBER10,2015

PURPOSE

The'eekDisabilityIndex(ND!)isaself-reportquestionnaireusedtodetermine how neckpain affectsa patient'sdaily lifeandtoassess theself-rated disabilityof patients with neck pain.

ACRONYM

DI

AREAOFASSESSMENT

Activities of Daily Living Attention&WorkingMemory FunctionalMobility
Life Participation OccupationalPerformance Pain
QualityofLife Sleep

ASSESSMENTTYPE

PatientReportedOutcomes

ADMINISTRATIONMODE

Paper&Pencil

COST

Free

COSTDESCRIPTION

Freetoaccessforstudents,physicians, clinicalpractice, andnon-fundedacademicusers.Feesmayapply for fundedacademicusers,healthcareorganizations, commercialusers,and ITcompanies.More detailscan befound ontheMapi Research Trust website: https:j/eprovide.mapi-trust.org/instruments/neck-disability-index

DIAGNOSIS/CONDITIONS

PainManagement

Na:¥PISIBUUY'J'Npfl

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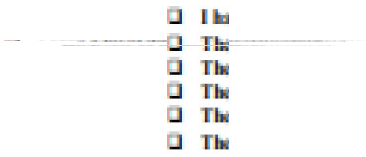

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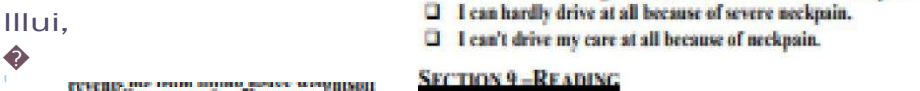

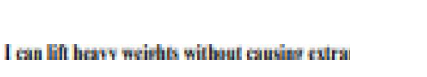

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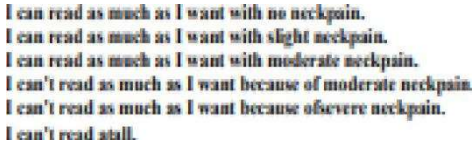

I can drive my car without neckpain.
I can drive as long as I want with slight neckpain.
I can drive as long as I want with moderate neckpain.
I can't drive as long as I want because ofmoderate neckpain.
I can hardly drive at all because of severe neckpain.
I can't drive my care at all because of neckpain

❑ I cannot lift or carry anythingatall.

have no headaches atall.
have slight headaches that comeinfrequently.
have moderate headaches that comeinfrequently.
have moderate headaches that comefrequently.
have severe headaches that comefrequently.
have headaches almost all thetime.

SECTION 4 – WORK

SECTION 10 – RECREATION

From

Ms.Visali .C.E.J
ivlPT11Year-OrthopedicsandTraumntology FacultyofPhysiotherapy
Sri RamachnndraInstitute orHigher Education and Research (DeemedtobeUniversity)
Chennai-600116

ToePrincipal
FacultyofPhysiotherapy
SriRamacbandraInstituteofHigher Education andResearch (DeemedtobeUniversity)
Cbennai-600116

To

Throughproperchannel

Respectedsir,

Sub:Permissionfordatacollection-dissertation-Regarding

I hereby informyou that, i amintendedto a study titled **"FACTORSINFLUEi.'iCING CERVICALPROPRIOCEPTION**IN**INDMDUALSWITHNECKPAIN"**under theguidanceofMr.Subbiah.kAssociateprofessorasmydissertation.Inthisregardl requestyourkindpermissionfordatacol_lectionfromthephysiotherapyoutpatient department (G-block).

Thankingyou

Guide

Yoursfaithfully

Visali.C.E.J

From

Ms.Visali .C.E.J
MPT11Year-OrthopedicsandTraumatology Faculty of Physiotherapy
SriRrunnchnndm Instituteof◆igherEducationandResearch (Deemed to be University)
Chennai-600116

To

TheChairman
TheInstitutionalEthicsCommittee
(Other Than Drugs/DiagnosticsNaccines/Herbal Remedies) Sri Ramachandra
InstituteofHigherEducation andResearch (Deemed to be University)
Chennai-600116

TitroughProperChannel Respected Sir,

Sub:Submission-StudyProposal-IECapproval-Regarding

[amherewithsubmitting aproposalforethicalapproval for mydissertationtitled "FACTORS INFLUENCING CERVICAL PROPRIOCEPTION IN INDIVIDUALSWITHNECK**PAIN"**for your consideration. I kindly requestyou to do the needful.

ThankingYou,

Yoursfaithfully

Guide
18/04/22
Mr.Subbiah.k

Forwarding for permission.
R. Sivakumar
18/04/2022